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ABSTRACT

The network of causal relations between academic self-concept and academic achievement was examined using five waves of the Flemish longitudinal research in secondary education project (J. Van Damme, et al, 1997). Participants were 6,411 students in 59 secondary schools in Flanders, followed for 7 years. Correlational and regression analyses were used to prepare structural equation models (SEM) that were used with multiple indicators of both school performance and academic self-concept to establish the bidirectional causal influence between both concepts. Subsequent academic self-concept is based on prior achievement, and, in addition, prior academic self-concept forms subsequent achievement. The path from self-concept to academic achievement was enriched by the inclusion of students' perceptions of the relevance of the school and the self-report of the degree of effort expenditure. Results support the motivational influence of academic self-concept. Moderator effects of sex and school characteristics were also examined, using multisample SEM. Variables of both these types were identified as important moderators within the bidirectional network. (Contains 11 tables and 18 references.) (SLD)

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Abstract

The purposes of this study were to examine the network of causal relations between academic self-concept and academic achievement using five waves of the Flemish longitudinal research in secondary education project (Van Damme et al. 1997). Correlational and regression analyses prepared the structural equation models. Using structural equation models (SEM), with multiple indicators of both school performance and academic self-concept we established the bidirectional causal influence between both concepts. Subsequent academic self-concept is based on prior achievement. And also the reverse path is valid whereby prior academic self-concept forms subsequent achievement.

The path from self-concept to academic achievement was enriched by the inclusion of students' perceptions of the relevance of the school and the self-report of degree of effort expenditure. The results support the motivational influence of academic self-concept.

Finally moderator effects of sex and school characteristics were examined, using multisample SEM. Both types of variables were identified as important moderators within the bidirectional network .

Introduction

The relation between the academic self-concept and academic achievement is supported by a large body of research (Muijs, 1997). However, the direction of causality between academic achievement and academic self-concept has been the subject of considerable interest and speculation in educational psychology (Helmke & van Aken, 1995). Calsyn and Kenny (1977) contrasted self-enhancement and skill development models of the self-concept and achievement relation. According to the self-enhancement model, self-concept is a primary determinant of academic achievement. In contrast, the skill development model implies that academic self-concept emerges principally as a consequence of academic achievement. Recently a reconciliation between both models in which their is a reciprocal relation between self-concept and achievement has been suggested (Marsh & Yeung, 1997).

Research on this topic has lead to inconsistent conclusions. Several studies have failed to find a causal relation of either self-concept on achievement or of achievement on self-concept. The contradictory and unexpected results are in part caused by methodological weaknesses. Marsh (1990) provided a useful overview of important design features to improve the research in this area. He pointed out the importance a) to measure academic self-concept and academic achievement at least twice, preferably more frequently b) to infer all latent constructs on the basis of multiple indicators and c) to consider a sufficiently large and diverse sample to justify the use of structural equation models and the generality of the findings.

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Few of the existing research on this topic satisfies this ideal situation. Marsh and Yeung (1997) found only nine longitudinal causal model studies and none was fully adequate in relation to Marsh's criteria of an ideal study. They concluded however that this research provided reasonably consistent support for the reciprocal effects model.

The causal link from academic achievement to academic self-concept seems very straightforward. The formation of the self-concept is considered to be the outcome of two processes, reflective appraisal and social comparison. Reflective appraisal refers to the development of the self-concept as a looking glass process. Individuals evaluate and understand themselves through information supplied by significant others in the home and at school (Hattie, 1992). The educational environment is a context in which evaluation processes have a pervasive and pertinent character. Teachers and also parents keep on hammering the importance of good grades. So it will be of no surprise if students use their achievement level as an index of their self-concept. Social comparison refers to the frame of reference group that individuals use when formulating their self-concept. Marsh 's "big fish little pond effect" refers to these social comparison processes, which are crucial in the formation of the self-concept. Students compare their academic accomplishments with those of others in their immediate frame of reference. If a student attends a school where the average ability level is high then he or she is likely to have a lower academic self-concept than a student with the same ability level who attends a school in which the average ability is low.

The causal influence of academic self-concept on subsequent achievements is little less obvious. Several authors belief that academic self-concept has motivational properties. If a student has a positive view on his academic competence, he will be motivated to strive a rather ambitious goal. Even when hinderded by obstacles, he will persist. Also the feelings of self-confidence which accompany high levels of academic self-concept will make an efficient task orientation possible. Students with low self-concept will lack these feelings of self-confidence . Doubts and uncertainty will have an harmful effect on their concentration and persistence.
Covington's selfworth-theory gives another explanation for the causal influence of the academic self-concept on academic achievement. Covington (1992) describes the existence of a so called selfworth motive. People have a desire to look at their selfs in a positive way. They strive a flattering self-evaluation. This desire gives cause to specific forms of self protective behavior. When children at school are confronted with events that harm their self-esteem, they will protect themselves in several ways. One typical way to buffer the feelings of self-esteem is to devaluate the importance of education and academic achievement. Also a diminished level of effort expenditure can be noted. After all the combination of high levels of effort and low achievement can lead to pessimistic conclusions about the abilities of the student.

The moderating effect of sex and the school climate has received little attention. The unusual female combination of lower academic self-concept despite a higher level of academic achievement than that of male students, suggests a gender linked causal pattern. Research on the transition from elementary school to middle school (junior high school) gives some important starting points (Eccles et al., 1996; Harter, 1992) in our exploration of the moderating effects of the school climate. Eccles et al. (1996) noted that school changes that heighten the salience of ability and focus attention on the evaluation of the self have debilating effects on all but the most confident and competent individuals.

The current study: research questions

The main objective of the current study is to test the bidirectional longitudinal causal model between academic self-concept and academic achievement. We will address the question if academic achievement and academic self-concept can be placed in a model of reciprocal influence and if they are indeed predictors of one another.

When this bidirectional causal model can be confirmed following the appropriate design features as articulated in the article of Marsh (1990) we will focus our attention on the path from

academic self-concept to academic achievement. In order to test the motivational properties of the academic self-concept and the existence of self protective behaviors, measures of concentration, perceived relevance of education and effort expenditure are included in the path from self-concept to achievement.

Finally, the moderating effects of sex and school characteristics are explored. We test the hypothesis of a gender linked bidirectional causal pattern. Schools were characterized on the basis of the relative importancy they attached to different educational goals. In schools with a strong emphasis upon cognitive development in a rather narrow sense were contrasted to schools with a strong emphasis upon the development of creativity. We expect that these school characteristics will moderate the impact of academic achievement upon self-concept. Schools with a strong accent upon cognitive development, the salience of good grades in traditional courses as mathematics and mother tongue often within a competitive spirit will be heightened. In this context social comparison will strenghten the path from academic (=cognitive) achievement towards self-concept. In schools with a focus on creativity not only traditional courses will be important for the academic self-concept. Aspects as creativity, personality development also will have a say in forming academic self-concept. In this sense we expect a weaker effect of academic achievement upon academic self-concept in this type of schools.

Method

Participants

Participants in the study come from the longitudinal research in secondary education project (LOSO) of Van Damme et al. (1997) which is funded by the Departement of Education of the Ministry of the Flemish Community. The data consists of longitudinal data of 6411 students of 59 secondary schools in Flanders. These students were followed for a period of seven years. Not only the students were questioned. The teachers and the principals of the schools they attended and their parents were other important sources of information.

Measures

Academic achievement: We used the scores on school achievement tests (mathematics and mother tongue). These tests are curriculum based and were approved by a board of inspectors and teachers. The mathematics achievement test (Minnaert, 1991) covers set and relations theory, theory of numbers and geometry. The language achievement test (Opdenakker, 1991) consists of items covering spelling, grammar, linguistic usage, information processing and reading comprehension. The achievement tests have therefore a high level of content validity. Because of technical conditions (e.g. the need to use multiple choice items, readable with an optical mask reading machine), however, a few newer topics in the curriculum relating to oral fluency and written language proficiency are not covered. The reliabilities of both achievement test are satisfactory: 0.90 for the mother tongue achievement test (dutch) and 0.80 for mathematics achievement (Van Damme et al., 1997). These achievement tests for language and mathematics were taken at the beginning and the end of the first grade and at the end of the second, fourth and sixth grade.

Academic self-concept: At the end of the first, second, fourth and sixth grade students had to fill in a questionnaire that measured different aspects of their non-cognitive adjustment. This questionnaire contains a nine-item scale "academic self-concept". Reliability (Cronbach's alfa) of this scale is 0.80. The questionnaire is an adopted version of the Dutch questionnaire 'Schoolvragenlijst' of Smits and Vorst (1982) and is supplied with some new items constructed on the basis of a questionnaire by Janssen (1982) and the scale 'academic self-concept of the Stoel's (1980) school questionnaire.

Effort expenditure, concentration and perceived relevance of education: The questionnaire of non-cognitive school adjustment which we mentioned above, included also three other scales

which we used as indicators of the degree of effort (5 items, α=0.82), concentration (10 items, α= 0.89) and perceived relevance of education (8 items, α=0.88).

School characteristics: As a measure of the 'cognitive' versus 'creative' orientation within the school we used the answers of a representative sample of teachers on a school characteristics questionnaire. This questionnaire includes several scales. One scale presents 8 different educational goals, in pairs of two. Each possible combination of two educational goals is presented. For each combination the teacher indicates the goal most characteristic for the school context and the extent in which this goal is more important than the other goal within the combination. For each goal a total score was obtained. The higher the score the more important that aim is within the school context according to the teacher. For each school the scores of its teachers were aggregated to become a score on the school level. We concentrated our attention on two educational goals who are more or less opposites of each other, namely cognitive development (in the narrow sense of knowledge acquisition) versus creativity development.

Methods

The data were analysed using correlation, regression and the method of structural equation modeling. The correlational analyses were applied to test the assumption that there is a statistical relationship between the two variables, academic self-concept and academic achievement. Of course a study of the causal influences between these concepts doesn't make sense, if no statistical significant correlation can befound. However, we did not use the standardized achievement scores in their original form. At first we transformed these scores into so called relative scores. These relative scores refer to the relative position of the student within a schoolspecific frame of reference. This transformation fits the introductionary remarks that relative achievement seems a more interesting variable than absolute achievement as it is relative achievement within the pupils' reference group that will determine perceptions of ability. We recoded the standardized test scores using the technique described by Muijs (1997). Rankings of pupils were made for each school and each wave. These rankings were divided by the number of pupils in that school and then multiplied by 100. When a school was represented by less than 10 subjects, no scores were computed. For the sake of completeness, we mention that we have checked the validity of this technique of transformation. We submitted the testscores to another procedure of transformation that also takes into account the relative position of the student. This transformation refers to the deviation of the individual score from the mean score of the reference group (in this case students of the same grade within the own school), divided by the standard deviation of the scores of the reference group. These newly constructed scores correlate very strongly with the scores based on the ordering of the students (0.99). Also the correlations between these new scores and the scores on academic self-concept are strongly similar (Tabel 1). Following this congruence only the first mentioned transformations were used in the regressions and the structural equation modeling.

Tabel 1. Relative scores for mother tongue and mathematic achievement: ranking scores (rlang & rmath) versus deviation scores (dlang & dmath), correlations with academic self-concept.

	Rlang1	Dlang1	Rmath1	Dmath1	Azc1	Azc2
Rlang1	1,000					
Dlang1	0,993	1,000				
Rmath1	0,626	0,628	1,000			
Dmath1	0,628	0,631	0,993	1,000		
Azc1	0,275	0,278	0,232	0,237	1,000	
Azc2	0,241	0,245	0,245	0,250	0,578	1,000

All correlation coefficients are significant at the 0.01-level

When a statistical significant and positive correlation was found, additional regression analyses were performed to ascertain that this correlation wasn't the result of shared background characteristics of pupils. Several background variables were used, for example gender, language spoken in the home (Dutch-speaking or not), intelligence, parental educational level and global feelings of school well-being at the end of the first grade. A dummy variabele was created for gender and language spoken in the home.

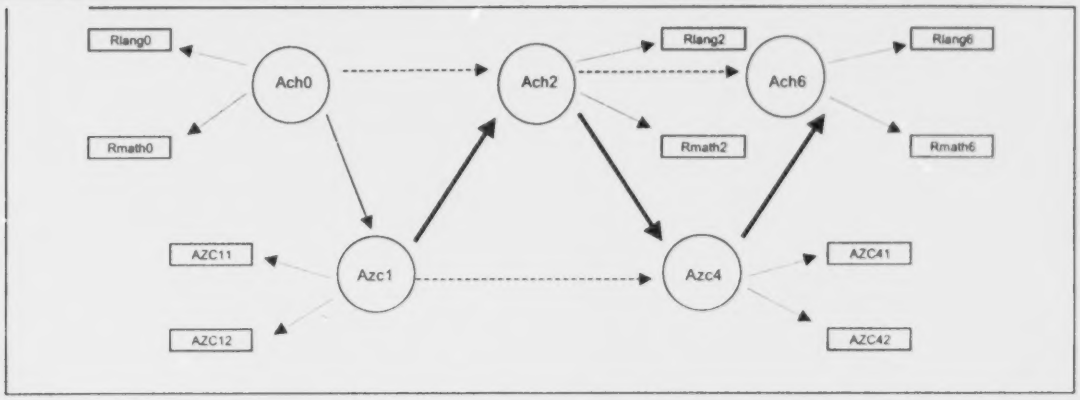
The longitudinal design, combined with a careful choice of the moment of measurement of the academic self-concept and the academic achievement makes a preliminary exploration of the causal network of relations possible. To this end threefold regression analyses were performed, respectively on the relative mother tongue scores and the relative mathematic scores at the end of the second grade and on academic self-concept at the end of the fourth grade.

Only the data of non-repeaters that consequently followed a study programme in the same category of education during the upper four grades of secondary education were used. This selection was made to obtain a connection between the measures of academic self-concept and academic achievement continually holds some meaning over a period of two years (distance between studied waves). We will illustrate this decision by means of a concrete example. In Flanders (Belgium) secondary education consists out of six grades. As from the third grade four different categories of study programmes are distinguished, namely general, artistic, technical and vocational education. The order in which these categories are mentioned correspond with their position in the hierarchy of cognitive difficulty level. At particular moments in their secondary school career path pupils can choose a study programme at a lower level. If the student follows general education at the end of the fourth grade but changes in the fifth grade towards a study programme at the level of technical education, measures of academic self-concept and (relative) achievement at the end of the fourth grade will loose a lot of their relevance towards measures of (relative) achievement and self-concept, respectively, at the end of the sixth grade. After all the change in educational level will lead to a different repertory of achievements which will be interpreted using a new frame of reference.

We used the stepwise regression method. Only variables that exceeded the 0.05 level of significance were included in the regression. Variables already in the regression equation are removed when their significance drops below this threshold.

The testing of the hypothetical bidirectional causal structure was done using the DOS-version of LISREL8.02 (Joreskog & Sorbom, 1993). The lisrel analyses were performed upon a further limited sample of the data that we used for the regression analyses. As already said, only the data of non-repeaters who consequently followed a study programme at the general educational level were used (N=1335). Formulation of the tested basic causal model is shown in Figure 1.

Figure 1. Basic causal model



In this model three latent variables refering to achievement and two latent variables refering to academic self-concept are interconnected. Each latent variable is formed from two manifest variables. The two manifest variables refering to academic self-concept are constructed out of the single score on the respective scale. The scores on the even, respectively, the odd items were used to make two subscores. Errors of test scores refering to the same instruments completed on different occasions were allowed to correlate in order to get accurate estimates of the relations among the latent constructs (Marsh, 1993). Following Bentler (1990) we use the Comparative Fit Index to evaluate the goodness of fit of the postulated causal model. This index indicates to what extent the tested model fits the data better than a so called baseline model. The latter refers to a model of independence, in which the latent variabeles are uncorrelated. Values between 0.90 and 0.95 indicate an acceptable level of fit. Values of 0.95 or more reflect a (very) good fit. This fit index was used in combination with the NNFI (>0.9 = good fit) and the RMSEA (<0.05 = good fit).

We will focus on the parameter estimates of the crucial causal paths. For present purposes three paths are of critical importance, a) the path from academic self-concept at the end of the first grade to achievement at the end of the second grade (Azc1 → Ach2) b) the path from achievement at the end of the second grade to academic self-concept at the end of the fourth grade (Ach2 → Azc4) and c) the path from academic self-concept at the end of the fourth grade to academic achievement at the end of the sixth grade (Azc4 → Ach6). The paths leading form prior achievement to immediately subsequent achievement and from prior self-concept to subsequent self-concept are considered as control paths. The paths connecting the achievement latent variables of the several occasions will control the causal effect of self-concept on achievement. The paths between the self-concept latent variabeles will have a controlling effect on the causal influence of achievement. The path between achievement at the beginning of the first grade and self-concept at the end of the first grade (Ach0 → Azc1) is without this control and therefore can not be considered as a "causal path". It merely reflects the correlation between both variables.

The causal model that we described in Figure 1 was also used to examine the moderating influence of sex and of school characteristics. These moderating effects were explored using multigroup SEM-analysis. In the first multigroup analysis the causal structure of both genders was compared. In the second multigroup analysis we compared students of different kinds of schools. For this analysis only the students who remained the six grades of secondary education

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in the same school were considered. We ordered the schools according to their score upon the educational goals: cognitive development and creativity development. The first group contains the pupils who attented the three schools with the highest score with respect to cognitive development respectively creativity development; the second group contains the pupils from the three lowest scoring schools. In these multigroup analysis only the critical paths in the a priori model were tested for equivalence across groups. When this demand for invariance across groups doesn't harm the fit of the global model in a significant way the moderator hypothesis can be rejected. However if the fit of the model deteriorates in a significant way, the interaction effect is supported.

In our investigation of the motivational properties of the academic self-concept we transformed the basic model to a model that interconnects the academic self-concept and academic achievement with motivational variables, namely concentration, effort expenditure and perceived relevance of education. Each of these new latent variables is represented by two manifest variables. Again we made two subscores out of one scale score, using the above described technique. At first we included these three concepts separately. Figure 2 shows the tested model. The model contains five latent variables, two refering to academic achievement (respectively at the end of the first and sixth grade of secondary education), one refering to academic self-concept (namely at the end of the second grade) and two variables refering to one of the three added motivational dimensions (respectively at the end of the first and fourth grade of secondary education). This composition of the structural model makes it possible to control the influence of the academic self-concept (Azc2) on academic achievement (Ach6) and upon the added aspects of motivation for prior academic achievement (Ach1), respectively the previous position on the added motivational component.

Figure 3 shows our final model which includes a causal relation between perceived relevance and effort. This causal model consists out of six latent variables, namely achievement at the beginning of the first grade and at the end of the sixth grade, academic self-concept at the end of the first grade, perceived relevance of education at the end of the second grade, and effort expenditure at the end of the first and fourth grade. Each latent variable is formed from two manifest indicators.

Figure 2. Causal model: separate inclusion of motivational variables

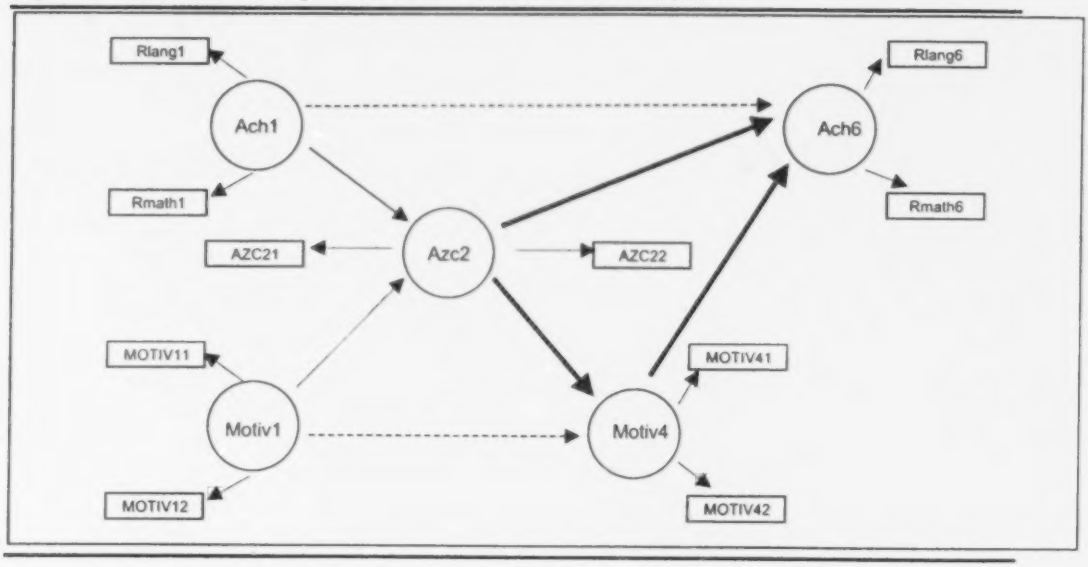

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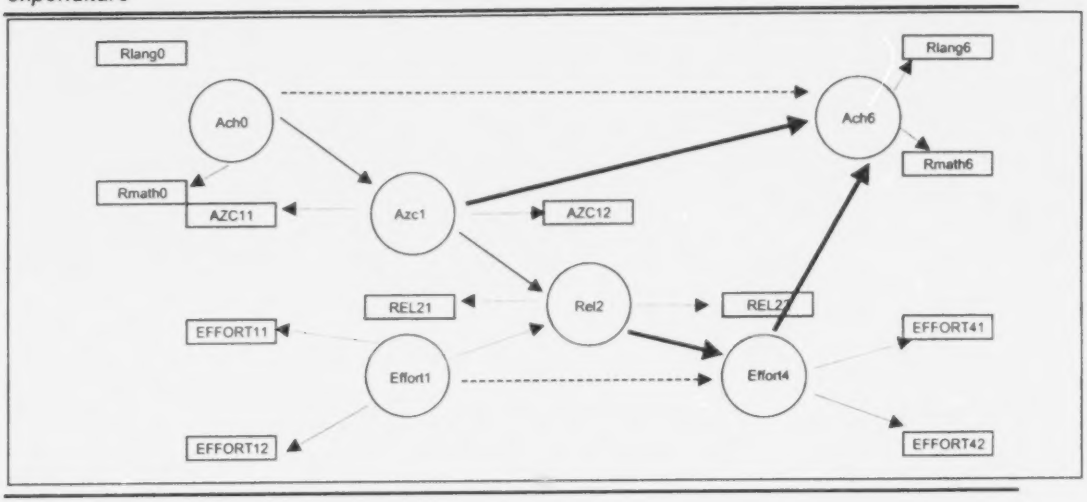
Figure 3. Causal model: inclusion of causal path between perceived relevance and effort expenditure



Results

Relation between academic self-concept and academic achievement: correlations

The correlations between the scores on the scale academic self-concept and the scores on the achievement tests for mother tongue and mathematics at the end of the first, second, fourth and sixth year are shown in Tabel 2.

The results summarized in this tabel support the hypothesis that academic self-concept and academic achievement are significantly correlated.

Tabel 2. Pearson correlations between academisch self-concept (Azc) and relative academic achievement scores for mother tongue (Rlang) and mathematics (Rmath)

	End of 1ste year	N	End of 2de year	N	End of 4de year	N	End of 6de Year	N
Azc– Rlang	0.314	5095	0.268	5242	0.147	4056	0.160	4851
Azc – Rmath	0.310	4879	0.227	5117	0.131	3950	0.199	3329

All correlations are significant at the 0.01-level

Academic self-concept, achievement and background variables: regressions

The results of the regression analyses show that academic self-concept at the end of the first year is a significant predictor of subsequent achievement even when the different background variables are controled for (see Tabel 3 and 4). The strength of this prediction however is not very high. Both indicators of achievement are more strongly predicted by the level of achievement measured at a previous occasion. This relation reflects the relative stability of school performances over time. Another more powerful predictor is the level of intelligence of the student.

Tabel 5 contains the results of the regression analysis on academic self-concept scores at the end of the fourth year. In addition to the mentioned background variables we entered the academic self- concept scores (AZC1) and the relative scores for mother tongue (Rlang2) and mathematics (Rmath2) measured at a previous moment (the end of the first grade, respectively the end of the second grade) as predictors into the regression equation. The relative

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achievement scores significantly predict subsequent self-concept, but are again not the most important predictors. The relative scores for mathematic reach only just the 0.05-level of significance. The main predictor of academic self-concept at the end of the fourth grade is the prior level of self-concept.

Tabel 3. Regression coefficients of the significant predictors of the relative achievement score for mother tongue at the end of the second grade

	β	t-value	R^2
AZC1	0.055	3.673	
RLang(0)	0.532	30.893	
Intelligence	0.204	11.764	
Gender[1]	-0.087	-5.900	
Language at home[2]	-0.052	-3.494	
			0.449

[1]0=girl/1=boy
[2]0=not exclusively Dutch speaking/1=exclusively Dutch speaking (not exclusively Dutch speaking mostly means: from a family of immigrants)

Tabel 4. Regression coefficients of the significant predictors of the relative achievement score for mathematics at the end of the second grade

	β	t-value	R^2
AZC1	0.097	5.664	
Rmath(0)	0.419	20964	
Intelligence	0.127	6.249	
Language at home[1]	-0.055	-3.231	
			0.276

[1]0= not exclusively Dutch speaking/1=exclusively Dutch speaking

Tabel 5. Regression coefficients of the significant predictors of the score on the academic self-concept scale at the end of the fourth grade

	β	t-value	R^2
Rlang(2)	0.084	3.763	
Rmath(2)	0.037	1.771	
AZC1	0.355	19.570	
Gender[1]	0.108	6.011	
Intelligence	0.068	3.275	
Educational level father	0.037	2.045	0.199

[1]0=girl/1=boy

The causal structure carefully examined: structural equation modeling

The lisrel analyses using the structural model as depicted in Figure 1 result in a CFI of 0.99. This value indicates that this model fits the data very well. An inspection of the parameter estimates of the crucial paths (Tabel 6) shows that the paths between adjacent concepts are clearly the strongest (0.82, 0.79 & 0.42) but also supports the bidirectional causal influences between academic self-concept and academic achievement. The paths leading from prior self-concept to subsequent achievement are significant even after controlling for the effects of prior achievement. Coupled with similar findings of achievement effects, these results cleary point to

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a reciprocal causal relation between the two concepts. The path leading from achievement to academic self-concept is in this causal relation predominant.

Tabel 6. Path coefficients of the basic causal model (N=1335)

Paths of measurement model	Coefficient
Ach0 → Rlang0	0.78*
Ach0 → Rwisk0	0.73*
Ach2 → Rlang2	0.80*
Ach2 → Rmath2	0.65*
Ach6 → Rlang6	0.73*
Ach6 → Rmath6	0.52*
Azc1 → AZC11	0.77*
Azc1 → AZC12	0.84*
Azc4 →AZC41	0.86*
Azc4 → AZC42	0.84*
Paths of structural model	
Ach0 → Azc1	0.37*
Azc1 → Ach2	0.07*
Ach2 → Azc4	0.17*
Azc4 → Ach6	0.12*
Ach0 → Ach2	0.82*
Ach2 → Ach6	0.79*
Azc1 → Azc4	0.42*
Modelfit	
Adjusted GFI	0.99
CFI	0.99
NNFI	1.00
RMSEA	0.016

* significant at the 0.05-level

• the non-diagonal elements in the theta delta and theta epsilon matrices were not significant at the 0.05-level

Moderating effects of sex and school characteristics

Now that we have established the reciprocal relationship between academic self-concept and achievement, we address the question to which extent this causal structure can be generalized across different groups. As mentioned this research question is relatively new. We especially expect differences within the path from achievement towards self-concept.

The multigroup analysis for both gender groups, results in one significant interaction effect, namely in the path from self-concept at the end of the first grade to the achievement level at the end of the second grade ($\Delta\chi^2$ (df=1)=8.89, $p<.01$) (see Tabel 7). For boys, this path is significant at the 0.05 level. For girls this estimate doesn' t reach the 0.05-significance threshold. The non-significance of this path is combined with a high stability of the achievement variables at the beginning of the first grade and the end of the second grade. Surprisingly in the higher grades of secondary education the gender typed difference in the strength of the path from self-concept to achievement is reversed. Although both estimates are not significantly different, for boys this estimate is lower (not significant at the 0.05-level) than for girls (significant at the 0.05-level). Our results suggest the existence of a complex gender linked causal pattern.

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Tabel 7. Multigroup analysis: boys (N=512) versus girls (N=823), path coefficients of the basic causal model – common metric completely standardized solution

Paths of measurement model	Boys	Girls
Ach0 → Rlang0	0.80*	0.80*
Ach0 → Rwisk0	0.73*	0.70*
Ach2 → Rlang2	0.82*	0.82*
Ach2 → Rmath2	0.62*	0.65*
Ach6 → Rlang6	0.76*	0.76*
Ach6 → Rmath6	0.55*	0.46*
Azc1 → AZC11	0.78*	0.78*
Azc1 → AZC12	0.86*	0.81*
Azc4 →AZC41	0.85*	0.85
Azc4 → AZC42	0.80*	0.87
Paths of structural model		
Ach0 → Azc1	0.35*	0.36*
Azc1 → Ach2[1]	**0.15***	**-0.02**
Ach2 → Azc4[2]	**0.12***	**0.19***
Azc4 → Ach6[3]	**0.06**	**0.11***
Ach0 → Ach2	0.82*	0.95*
Ach2 → Ach6	0.78*	0.82*
Azc1 → Azc4	0.46*	0.39*

- significant at the 0.05-level
- 1) ($\Delta\chi^2$ (df=1)=8.89, p<.01)
- 2) ($\Delta\chi^2$ (df=1)=0.91, p>.05)
- 3) ($\Delta\chi^2$ (df=1)=1.02, p>.05)

In our exploration of the moderating effect of certain school characteristics we selected the data of the pupils of the three schools with the highest scores, respectively the lowest scores on the educational goal "cognitive development". To test the stability of these results we made the same exercise with students of the three schools with the highest scores, respectively the lowest scores on the educational goal "creativity development". We expect that the results of this analysis will be the mirror image of the prior, considering the complementary character of both educational goals. Again we anticipate differences in the path from achievement towards self-concept. In schools with a strong focus on the cognitive aspects of development good grades, and in this sense also the relative position of the pupil in the classroom, are stressed, especially if it concerns "traditional" contents as mathematics and mother tongue. Schools with a strong "creativity focus" not only the grades for traditional courses of the pupils are taken in consideration. We anticipate that in the first context pupils will concentrate upon their grades when forming their self-concept. In the latter schools pupils will use, besides their grades and relative academic position in the classroom, several other sources of feedback.

In Tabel 8 and Tabel 9 we show the results of these multigroup LISREL-analyses. These results do not confirm our expectations. No significant group differences can be noted in the path from achievement to self-concept, in both multigroup analyses. In the second multigroup analysis there is a non-significant tendens towards a stronger causal path from achievement to academic self-concept under the condition of a low focus on creativity. This difference is not statistical significant and is not supported by the first multigroup analysis. However, other than anticipated interaction effects with the examined school characteristics are noted, namely in the reverse causal path from self-concept towards achievement. In schools with a high focus on cognitive development a strong stability tendens over the different time moments can be noted

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for academic achievement. This type of schools is characterized by little or no change in the relative ordering of students over time. The influence of academic self-concept is neglible. These results are supported by the second multigroup analysis in which groups were formed using the creativity score. In schools with little attention for the creativity of the student, their is little or no change in the relative ordering of students. In this context of stability over time, academic self-concept has no significant effect.

Tabel 8. Multigroup analysis: low cognitive development (N=283) versus high cognitive development (N=168), path coefficients of the basic causal model – common metric standardized solution

Paths of measurement model	Low focus on cognitive development: coefficients	High focus on cognitive development: coefficients
Ach0 → Rlang0	0.87*	0.87*
Ach0 → Rwisk0	0.80*	0.69*
Ach2 → Rlang2	0.84*	0.84*
Ach2 → Rmath2	0.60*	0.71*
Ach6 → Rlang6	0.73*	0.73*
Ach6 → Rmath6	0.58*	0.44*
Azc1 → AZC11	0.78*	0.71*
Azc1 → AZC12	0.88*	0.88*
Azc4 →AZC41	0.81*	0.81*
Azc4 → AZC42	0.94*	0.76*
Paths of structural model		
Ach0 → Azc1	0.33*	0.40*
Azc1 → Ach2[1]	**0.15***	**0.09**
Ach2 → Azc4[2]	**0.24***	**0.27***
Azc4 → Ach6[3]	**0.14***	**-0.05**
Ach0 → Ach2	0.82*	0.79*
Ach2 → Ach6	0.80*	0.94*
Azc1 → Azc4	0.37*	0.29*

significant at the 0.05-level

1) ($\Delta\chi^2$ (df=1)=-10.51, p<0.01) – negative sign means indicates that the model with invariant path is a model of better fit

2) ($\Delta\chi^2$ (df=1)=7.27, p<0.01)

3) ($\Delta\chi^2$ (df=1)=-8.31, p<0.01)

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Tabel 9. Multigroup analysis: low creativity (N=147) versus high creativity (N=249), path coefficients of the basic causal model – common metric standardized solution

Paths of measurement model	Low focus on creativity: coefficients	High focus on creativity: coefficients
Ach0 → Rlang0	0.81*	0.81*
Ach0 → Rwisk0	0.85*	0.73*
Ach2 → Rlang2	0.83*	0.83*
Ach2 → Rmath2	0.85*	0.61*
Ach6 → Rlang6	0.75*	0.75*
Ach6 → Rmath6	0.59*	0.65*
Azc1 → AZC11	0.97*	0.73*
Azc1 → AZC12	0.86*	0.86*
Azc4 →AZC41	0.85*	0.85*
Azc4 → AZC42	0.88*	0.92*
Paths of structural model		
Ach0 → Azc1	0.31*	0.44*
Azc1 → Ach2[1]	**-0.06**	**0.04**
Ach2 → Azc4[2]	**0.28***	**0.20***
Azc4 → Ach6[3]	**0.06**	**0.24***
Ach0 → Ach2	0.98*	0.93*
Ach2 → Ach6	0.95*	0.78*
Azc1 → Azc4	0.50*	0.35*

significant at the 0.05-level

($\Delta\chi^2$ (df=1)=-1.63, p>0.05)

($\Delta\chi^2$ (df=1)=0.78, p>0.05)

($\Delta\chi^2$ (df=1)=5.18, p<0.05)

The motivational properties of the academic self-concept

To unravel the path leading from academic self-concept to achievement we entered motivational variables into our bidirectional model. Figure 2 shows the tested causal structure when examining the causal influences of the additional motivational properties seperately. Tabel 10 shows the parameter estimates of the three tested causal structures.

These results show that the causal influence of the academic self-concept are in part the result of the connection between academic self-concept and the perceived relevance of education. However the path leading directly form academic self-concept to achievement also stays significant at the 0.05-level of significance. These findings support the self-worth perspective. Pupils can protect themselves for the damaging impact of bad grades on their self-esteem by diminishing the importance of education. The intervening influence of effort expenditure and of concentration is not supported.

Tabel 10. Motivational properties of the academic self-concept: Path coefficients of the causal model with concentration (n=1352), effort expenditure (n=1360) and perceived relevance of education (n=1352)

Paths of measurement model	Concentration	Effort	Perceived relevance
Ach1 → Rlang1	0.75*	0.75*	0.72*
Ach1 → Rwisk1	0.81*	0.81*	0.84*
Ach6 → Rlang6	0.67*	0.68*	0.64*
Ach6 → Rmath6	0.59*	0.59*	0.63*
Azc2 → AZC21	0.82*	0.82*	0.83*
Azc2 → AZC22	0.84*	0.84*	0.85*
Motiv1 → MOT11	0.91*	0.75*	0.84*
Motiv1 → MOT12	0.85*	0.71*	0.87*
Motiv4 → MOT41	0.99*	0.91*	0.88*
Motiv4 → MOT42	0.86*	0.80*	0.92*
Paths of structural model			
Ach1 → Azc2	0.29*	0.27*	0.29*
Motiv1 → Azc2	0.36*	0.34*	0.29*
Azc2 → Motiv4	0.02	-0.02	0.07*
Azc2 → Ach6	0.12*	0.12*	0.11*
Motiv4 → Ach6	0.06*	0.08*	0.10*
Ach1 → Ach6	0.67*	0.67*	0.67*
Motiv1 → Motiv4	0.50*	0.56*	0.46*
Modelfit			
Adjusted GFI	0.99	0.99	0.99
CFI	0.99	0.99	0.99

- significant at the 0.05-level
- the non-diagonal elements in the theta delta and theta epsilon matrices were not significant at the 0.05-level

Next we focused on the joined effect of the degree of effort and perceived relevance of education. The causal structure we tested is shown in Figure 3. The results summarized in Tabel 11 holds support for the assumptions of the self-worth theory of Covington. Academic self-concept has a causal impact on perceived relevance, which in its part has a causal influence on the level of invested effort. And the level of effort at the end of the fourth grade determines in its part the achievement level at the end of the sixth year. The causal path leading from perceived relevance to invested effort stays significant at the 0.05-level even after controlling for the prior level of effort.

Tabel 11. Motivational properties of the academic self-concept: Path coefficients of the causal model with a causal path between perceived relevance of education and effort expenditure (n=1260)

Paths of measurement model	Coefficients
Ach0 → Rlang0	0.78*
Ach0 → Rwisk0	0.72*
Ach6 → Rlang6	0.75*
Ach6 → Rmath6	0.51*
Azc1 → AZC11	0.78*
Azc1 → AZC12	0.84*
Rel2 → REL21	0.92*
Rel2 → REL22	0.87*
Inz1 → INZ11	0.73*
Inz1 → INZ11	0.75*
Inz4 → INZ41	0.88*
Inz4 → INZ42	0.84*
Paths of structural model	
Ach0 → Azc1	0.39*
Azc1 → Rel2	0.13*
Rel2 → Inz4	0.16*
Inz4 → Ach6	0.06*
Azc1 → Ach6	0.02
Ach0 → Ach6	0.72*
Inz1 → Rel2	0.36*
Inz1 → Inz4	0.46*
Modelfit	
Adjusted GFI	0.92
CFI	0.94
NNFI	0.91
RMSEA	0.098

- significant at the 0.05-level
- the non-diagonal elements in the theta delta and theta epsilon matrices were not significant at the 0.05-level

Discussion

The purposes of this study were to evaluate the reciprocal causal influences between academic self-concept and academic achievement from a longitudinal perspective. Lisrel analyses, preceded by preliminary correlational and regression analyses support this reciprocal model. Academic self-concept and academic achievement are each other's cause and effect. This conclusion is of theoretical and practical significance. The path leading from academic achievement to academic self-concept holds an important message for counseling of pupils at times of study career choices. This counseling prevents unreasonble high choices and in effect a damaged self-concept. This damaged self-concept will in its turn effect the performances of pupils. They will devaluate the importance of education and lower their investment of effort. Also other forms of school disengagement can be seen, for example problem behavior in the classroom, truancy and delinquency within the school context. However this latter conclusions reach beyond the scope of the present study.

In the path from academic achievement toward academic self-concept no moderating influences of sex and of school characteristics are seen. It's the reverse path that differs in function of the group in which it is examined. These results shed a different light upon the inconsistent

research findings concerning this path. The strength and in this sense also the significancy of this path are strongly associated with the subjects (and their educational context) which are included in the study. In this sense not only statistical techniques are important to reflect on, but also the concrete dataset on which these techniques are applied.

Concerning the moderating influences of sex, results suggest an interaction between sex and grade. In the first grades of secondary education, the differences between both sexes go in the opposite direction of the differences observed in the higher grades.

The observed moderating influences of the examined school characteristics, places the effect of academic self-concept upon achievement in perspective. The effect of the academic self-concept is inverse proportional with the stability of academic achievement over time. Schools that accentuate cognitive development and minimalize creativity are also characterized by a high stability in the relative positioning of pupils. The hypothesis that schools with a narrow focus on cognitive achievement, on traditional courses and grades foster competition and by this way heighten the risk of a lower academic self-concept is not confirmed. But with regard to this hypothesis the following can be concluded. If these risks for the self-concept would exist, they would be without further consequence, given the high stability in relative achievement position that can be noted under those conditions. Under these conditions changes in academic self-concept do not lead to changes in subsequent achievement, given the limited changes in relative achievement position over time. These results also shed a different light upon the motivational properties of the academic self-concept. The relevancy of these motivational properties is bound to certain characteristics of the educational environment.

Despite the fact we followed as much as possible the design features formulated by Marsh, this research is not without limitations. At first it is important to notice that the predictive value of both variables towards each other is modest. For example, compared with other research on the topic, the path leading from prior achievement to subsequent self-concept is particulary low (Muijs, 1997; Marsh & Yeung, 1997). The fact that the used test scores were not integrated within the daily classroom routine holds a possible explanation. For example the students did not get any feedback about these test scores. The unavailability of school marks obtained from official school records posits in this way an important limitation in the present study. Another explanation is the relatively large distance between the different waves in this study (two grades). Another weakness is the combination of different subject matters in one global achievement variable. In this manner we neglect the possibility that both subject matters are characterized by a different causal pattern. Further when conducting the multigroup analysis, we made use of only a small part of the available data. In this manner complex SEM-analyses were done using small samples, which forces us to place question markes with the generability of the findings.

References

Bentler, P.M. (1990). Comparative fit indices in structural models. Psychological Bulletin, 107, 238-246.

Calsyn,R.J., & Kenny, D.A. (1977). Self-concept of ability and perceived evaluation of others: Cause or effect of achievement. Journal of Educational Psychology, 69, 136-145.

Covington, , M.V. (1992). Making the grade: A self-worth perspective on motivation and school reform. Cambrigde: Cambridge University Press.

Eccles, J.S., Lord, S. & Miller Buchanan, C. (1996). School transitions in early adolescence: What are we doing to our young people. In J.A. Graber, J. Brooks-Gunn & A.C. Petersen (Eds). Transitions through adolescence. Interpersonal Domains and Context. Lawrence Erlbaum Associates: New Jersey.

Hattie, J.B. (1992). Self-concept. Hillsdale, NJ: Erlbaum.

Harter, S. (1992). Individual differences in the effects of educational transitions on young adolescents perceptions of competence and motivational orientation. American Educational Research Journal, 29, 777-807.

Helmke, A., & van Aken, M.A.G. (1995). The causal ordering of academic achievement and self-concept of ability during elementary school: A longitudinal study. Journal of Educational Psychology, 87, 624-637.

Janssen, P. (1982). Vragenlijst studiebeleving. Leuven: K.U.Leuven, Afdeling Psychodiagnostiek en psychologische begeleiding, Centrum voor schoolpsychologie.

Jöreskog, K.G., & Sörbom, D. (1993). LISREL 8: Structural equation modeling with the SIMPLIS command language. Chicago: Scientific Software International.

Marsh, H.W. (1990). Causal ordering of academic self-concept and academic achievement: A multiwave, longitudinal panel analysis. Journal of Educational Psychology, 82, 646-656.

Marsh, H.W., & Seeshing Yeung, A. (1997). Causal effects of academic self-concept on academic achievement: Structural equation models of longitudinal data. Journal of Educational Psychology, 89 (1), 41-54.

Minnaert, A. (1991). WIPREESO Schoolvorderingentoets wiskunde eind eerste leerjaar A secundair onderwijs (Mathematic achievement test end of first year A secondary education). Leuven: K.U.Leuven, Afdeling Psychodiagnostiek en Psychologische Begeleiding & Onderzoekscentrum voor secundair en hoger onderwijs.

Muijs, R.D. (1997). Predictors of academic achievement and academic self-concept: a longitudinal perspective. British Journal of Educational Psychology, 67, 263-277.

Opdenakker, M.-C.(1991). Schoolvorderingentoets Nederlands eind eerste leerjaar A secundair onderwijs (Dutch achievement test end of first year A secondary education). Leuven: K.U.Leuven: Onderzoekscentrum voor secundair en hoger onderwijs.

Stoel, W.G.R et al. (1980). De relatie tussen de grootte van scholen voor voortgezet onderwijs en het welbevinden van de leerlingen. Haren: Rion.

Smits, J.A.E & Vorst, H.C.M. (1982). Schoolvragenlijst voor basisonderwijs en voortgezet onderwijs: SVL. Handleiding voor gebruikers. Berkhout: Nijmegen.

Van Damme, J., De Troy, A., Meyer, J., Minnaert, A., Lorent, G., Opdenakker, M.C., & Verduyckt, P.(1997). Succesvol doorstromen in de aanvangsjaren van het secundair onderwijs. Leuven: Acco